# CENTRAL FOOD TECHNOLOGICAL RESEARCH INSTITUTE,
# MYSORE-570013

# RESEARCH PROJECTS PROPOSED FOR THE PERIOD
# APRIL 1990 - MARCH 1992

## AGENDA FOR
## RESEARCH COUNCIL MEETING
## DECEMBER 18-19, 1989

CENTRAL FOOD TECHNOLOGICAL RESEARCH

INSTITUTE,

MYSORE-570013

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Contents


A. **Thrust Area No.1: Rationalising Energy Inputs**

Disciplines

1. Process Engineering & Plant Design 1
2. Microbiology & Sanitation 2
3. Confectionery & Convenience Foods 3
4. Animal Products Technology 5
5. Fermentation Technology & Bioengineering 6
6. International School of Milling Technology 7
7. Milling & Baking Technology

B. **Thrust Area No.2: Reduction of Losses in Raw Materials**

Disciplines

1. Oilseeds Technology 9
2. Infestation Control & Protectants 10
3. Fruits, Vegetables & Plantation Crops 12
4. Cereal Science & Technology 13

C. **Thrust Area No.3: Quality Standards and Food Safety**

Disciplines

1. Food Chemistry 15
2. Nutrition & Food Safety 16
3. Microbiology & Sanitation 18&27
4. Autotrophic Cell Culture 19
5. Process Engineering & Plant Design 21
6. Sensory Analysis & Consumer Acceptance 23
7. Food Packaging & Distribution Engineering 24

D. **Thrust Area No.4: Targetted Nutrition for Specific Groups**

Disciplines

1. Food Chemistry 29
2. Nutrition & Food Safety 31
3. Fruits, Vegetables & Plantation Crops 32
4. Exprimental Animal Production Facility 34

E. **Thrust Area No.5: Technologies for Boosting Export Earnings**

Disciplines

1. Fruits, Vegetables & Plantation Crops 36
2. Confectionery & Convenience Foods 39

F. **Research in Emerging Areas**

Disciplines

1. Food Chemistry 41
2. Microbiology & Sanitation 49
3. Fruits, Vegetables & Plantation Crops 51
4. Animal Products Technology 52
5. Fermentation Technology & Bioengineering 53
6. Food Packaging & Distribution Engineering 54

G. **National Facilities - Creation of**

Disciplines

1. Microbiology & Sanitation 55
2. Food Packaging & Distribution Engineering 56

H. **Financial picture for 1989-90** 59

(Matter for kind information of Research Council)

I. **Research projects funded by organistions other than CSIR**

Disciplines

1. Autotrophic Cell Culture 62
2. Fermentation Technology & Bioengineering 62
3. Microbiology & Sanitation 63
4. Oilseeds Technology 64&67
5. Fruits, Vegetables & Plantation Crops 65
6. Food Chemistry 65
7. Nutrition & Food Safety 66
8. Cereal Science & Technology 66

## Thrust Area No.1:

## RATIONALISING ENERGY INPUTS

Project No.1 (Process Engineering & Plant Design): DEVELOPMENT OF MACHINERY AND GADGETS FOR TRADITIONAL INDIAN FOODS.

Leader: Shri A.Ramesh

Objectives:

1. Development of machinery and gadgets for production of selected traditional foods for use in industrial kitchens/canteens to reduce: (a) human drudgery, and (b) energy consumption, and to improve on (i) uniformity and quality, and (ii) production rates.

Milestones:-

Jun 90: 1. Designs for Laddu forming machine and for extrusion systems.

Sep 90: 1. Designs for cooking equipment.

Dec 90: 1. Designs for kitchen gadgets.

2. Fabrication of Laddu forming machine.

Mar 91: 1. Fabrication of cooking equipment.

Jun 91: 1. Fabrication of co-extrusion systems.

2. Schemes for continuous Laddu production line.

Sep 91: 1. Fabrication of kitchen gadgets.

Dec 91: 1. Testing of equipment.

2. Design of integrated production lines.

Mar 92: Finalization of designs.

Budget Estimate:

(Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 1.80 | 2.00 | 3.80 |
| Recurring | 3.00 | 5.00 | 8.00 |
| Capital | 0.50 | 0.50 | 1.00 |
| Total: | 5.30 | 7.50 | 12.80 |

Project No.2 (Microbiology & Sanitation): LACTIC AND ALCOHOLIC FERMENTATION OF EDIBLE STARCHY MATERIALS INTO FOODS AND BEVERAGES.

Leader: Dr.S.C.Basappa

Objectives:

1. Selection, hybridization, mutation and genetic engineering of suitable amylolytic, alcoholic and lactic cultures for conversion of selected starchy substrates into acceptable alcoholic and lactic foods and beverages.

2. To determine the conversion steps in the fermentation of raw materials into product, identify intermediate products and evaluate their role in aroma and flavours.

3. To develop processes for economic and hygienic production of traditional fermented foods and beverages such as wine, beer, vodka, madhu and infant foods.

Milestones:-

Jun 90: 1. Isolation, identification and selection of micro-organisms from traditional fermented products and inocula.

Sep 90: 1. Studies on metobolic activities of selected microorganisms and their effect on transformation of selected substrates.

Dec 90: 1. Improvement of the selected cultures by mutation, hybridization and genetic engineering means.

Mar 91: 1. Identification and characterisation of intermediatary flavour compounds formed during conversion.

Jun 91: 1. Standardizaation and evaluation of the processes.

Sep 91: 1. Organoleptic, nutritional and digestibility evaluations of the products.

Dec 91: 1. Studies on presrvation and shelf-life (microbiological and biochemical) of the products.

Mar 92: 1. Preparation of a technical dossier on the fermented products.

Budget Estimate: (Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 2.20 | 2.25 | 4.45 |
| Recurring | 0.50 | 0.50 | 1.00 |
| Capital | 1.50 | 2.50 | 4.00 |
| Total: | 4.20 | 5.25 | 9.25 |

Project No.3 (Confectionery & Convenience Foods): ENERGY ECONOMY IN FOOD PROCESSING (COOKING).

Leader: Mrs.Sarojini Dastur

Objectives:

1. To work out procedures for energy conservation in household and large scale cooking.

2. Design of an energy efficient rice cooking system, suitable to large scale catering establishments.

Milestones:-

Sep 90: 1. Completion of kinetic studies of major food stuffs.

Mar 91: 1. Completion of monograph on cooking processes.

Sep 91: 1. Assessment of the energy expenditure in One Food Industry.

Mar 92: 1. Design of energy efficient rice cooker.

Budget Estimate:

| | (Rs.in Lakhs) 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 2.06 | 1.73 | 3.79 |
| Recurring | 0.10 | 0.10 | 0.20 |
| Capital | 0.92 | 0.53 | 1.45 |
| Total: | 3.08 | 2.36 | 5.44 |

Project No.4 (Confectionery & Convenience Foods): CONVENIENCE FOODS TO MEET THE NEEDS OF TRAVELLING PUBLIC AND INDUSTRIAL LABOUR FORCE.

Leader: Shri S.N.Raghavendra Rao

Objectives:-

1. Development of cereal based breakfast foods.

2. Formulation of lunch packet containing ready-to-eat rice baths, chapati and sabji.

3. Substitution of deep fat frying in the preparation of certain snack foods. Development of puffed cereal snacks.

Milestones:-

Sep 90: 1. Breakfast foods for Soji and Poha; scale up of khakra preparation.

Mar 91: 1. Rice vermicelli based breakfast foods; pilot scale preparation, storage and packaging studies of breakfast foods based on Soji, Poha and Rice vermicelli.

Sep 91: 1. Puffed cereals as a snack product.

Mar 92: 1. Development of technology for lunch packets for travelling public and industrial workers.

(Rs.in Lakhs)

| Budget Estimate: | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 3.00 | 3.30 | 6.30 |
| Capital | 5.05 | 10.25 | 15.30 |
| Recurring | 0.30 | 0.30 | 0.60 |
| Total: | 8.35 | 13.85 | 22.20 |

Project No.5 (Animal Products Technology): DEVELOPMENT OF TECHNOLOGY TO IMPART SHELF-STABILITY AT AMBIENT CONDITIONS FOR SELECTED TRADITIONAL MEAT, POULTRY AND FISH PRODUCTS, AND STUDIES RELATED TO THEIR QUALITY AND SAFETY.

Leader: Shri R.B.Nair

Objectives:

1. Formulation and protective dehydration techniques for products like noodles, wafers and products of reduced water activity based on meat, poultry and fish.

2. To work out processing parameters for selected traditional meat, poultry and fish preparation for stable sterilised products by thermal processing.

Milestones:-

Jun 90: 1. Identification of sterilisation requirements of selected products.

Sep 90: 1. Process schedule for sterilization in different containers.

Dec 90: 1. Formulation of desiccated products.

Mar 91: 1. Prototype for desiccated products and packaging systems.

Jun 91: 1. Model systems for studies on ingredient interactions.

Sep 91: 1. Microbiological and quality evaluation of end-products.

Dec 91: 1. Shelf-life of thermal processed products.

Mar 92: 1. Shelf-life of dehydrated products.

Budget Estimate:

| | (Rs.in Lakhs) 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 2.90 | 3.00 | 5.90 |
| Recurring | 0.70 | 0.75 | 1.45 |
| Capital | 2.00 | 0.50 | 2.50 |
| Total: | 5.60 | 4.25 | 9.85 |

Project No.6 (Fermentation Technology & Bioengineering): DEVELOPMENT OF BIOPROCESSES BASED ON ENZYMES AND BIOCATALYSTS.

Leader: Dr.N.G.Karanth

Objectives:

1. To develop bioprocesses for transformation of substrates into useful products (glucose, high fructose syrup, ethanol, glycerol, upgraded straw and other biochemicals/products).

Milestones:-

Jun 90:
1. Optimising the conditions for liquefaction of starch in jet cooker.
2. Defining the parameters and determining their values for optimum recovery of glycerol from fermentor broth.

Sep 90:
1. Large scale trials on starch liquefaction in jet cooker, a controlled saccharification.

Dec 90:
1. Plant design for glucose from starch and studies on economic feasibility.
2. Isolation and screening of cultures for upgradation of straw.
3. Completion of lab. fermentor studies for glycerol on the cell recycling and higher temperature operation.

Mar 91:
1. Application of data on starch hydrolysis and isomerizaation of glucose for production of high fructose syrup, plant design and economic studies.

2. Optimisation of conditions of straw upgradation.

Jun 91: 1. Process development for ethanol from damaged wheat.

2. Completion of pilot plant fermentation for production of glycerol.

Sep 91: 1. Development of process for ethanol production from sweet potato.

2. Completion of laboratory scale trials on upgradation of straw.

Dec 91: 1. Process development for ethanol from damaged corn

2. Completion of pilot plant experiments on the recovery of glycrol.

Mar 92: 1. Plant design and feasibility studies on ethanol production from above starchy materials.

2. Upgradation of straw at 100 kg batch, plant design and economic studies.

3. Design of a large scale plant for glycerol by fermentation.

(Rs.in Lakhs)

| Budget Estimate: | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 6.60 | 6.80 | 13.40 |
| Recurring | 1.00 | 1.00 | 2.00 |
| Capital | 8.00 | 3.00 | 11.00 |
| Total: | 15.60 | 10.80 | 26.40 |

Project No.7 (International School of Milling & Baking Technology): DEVELOPMENT OF TECHNOLOGIES FOR NEWER VARIETIES OF BAKERY, TRADITIONAL AND SNACK FOODS.

Leader: Dr.P.Haridas Rao

Objectives:

1. Development of traditional bakery products aimed at meeting the needs of special target groups and consumers.

2. Development of bakery and traditional products based on cereals other than wheat and oilseed meals.

3. Development of modern technologies for traditional snack and savoury products.

Milestones:-

Jun 90: 1. Determination of conditions for the preparation of whole wheat flour bread. Developmment of variety breads with different flavours.

Sep 90: 1. Development of ready-toeat instant extruded products.

Dec 90: 1. Completion of study of the dough rheology of different traditional products and biscuits.

Mar 91: 1. Data on chemical and dough characteristics of interaction between legume flours and wheat flour.

Jun 91: 1. Development of ready-to-eat bread, buns with spices and stuffings.

Sep 91: 1. Inter-relationship between dough rheology, baking conditions and textural quality of baked and extruded products.

Dec 91: 1. Characterization of different traditional products.

Mar 92: 1. Shelf-life studies of variety baked and traditional products.

Budget Estimate:

(Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 4.25 | 4.75 | 9.00 |
| Recurring | 0.30 | 0.40 | 0.70 |
| Capital | 4.25 | 7.50 | 11.75 |
| Total: | 8.80 | 12.65 | 21.45 |

## Thrust Area No.2:

## REDUCTION OF LOSSES IN RAW MATERIALS

Project No.1 (Oilseeds Technology): MODERNIZAATION OF OILSEED MILLING WITH SPECIAL REFERENCE TO IMPROVEMENT IN RECOVERY AND QUALITY OF OIL AND PREPARATION OF VARIOUS TYPES OF VALUE-ADDED PRODUCTS.

Leader: Dr.G.Ramantham

Objectives:

1. Seed pretreatment procedures for cleaning, grading and decortication of oilseeds to get good quality oil and high grade meal.

2. Process for production of edible waxes from oilseed sources.

3. Non-aqueous processing for quality improvement of oil and edible meal.

4. Preparation of value-added products like dhal substitutes/extenders and protein rich convenience foods based on oilseed meals.

Milestones:-

Jun 90: 1. Dehulling of safflower, niger - preliminary studies.

Sep 90: 1. Data on effect of dehulling on the extraction and quality of oil (safflower, niger, sesame and others).

Dec 90: 1. Process for the preparation of bland soy flour/ groundnut flour.

2. Wax from rice bran oil - process for.

Mar 91: 1. Seed pretreatment procedures for cleaning, grading, decortication or dehulling of oilseeds (safflowr, sesame, niger and others).

Jun 91: 1. Completion of drying studies on Dhupa seeds.

2. Refining of rice bran oil - lab. scale.

Sep 91: 1. Decortication of mango kernel.

2. Partial defatting of groundnut by alcohol - large scale trials.

Dec 91: 1. Process for the preparation of wax from Sunflower

Mar 92: 1. Dhal substitute/extenders from oilseed cakes - Assessment of data for further work.

Budget Estimate: (Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 6.87 | 7.56 | 14.43 |
| Recurring | 5.00 | 7.50 | 12.50 |
| Capital | 1.00 | 1.25 | 2.25 |
| Total: | 12.87 | 16.37 | 29.18 |

Project No.2 (Infestation Control & Protectants): INTEGRATED PEST MANAGEMENT WITH AN ACCENT ON CONSUMER PROTECTION.

Leader: Dr(Mrs) M.K.Krishna Kumari

Objectives:

1. Newer pest control agents for rural and household storage systems.

2. Development of processes and products based on selectivity, biodegradability and consumer safety.

3. Development of a comprehensive, practical and economical pest control programme for the tropics.

Milestones:-

Jun 90: 1. Identification and isolation of pheromones from stored product insects: Trogoderma granarium and Stegobium panecium.

2. Development of adsorbant mixtures for removal of fats and pigments from foods prior to pesticide detection.

3. Evaluation of packaging materials and gas-proof sheets for the permeability/retention of atmospheric gases.

Sep 90: 1. Screening of atmospheric gases for controlling storede grains.

2. Utilisation of unicellular organisms as models for detecting cytotoxicity of pesticides.

3. Development and application of lures and traps based on semiochemicals.

Dec 90: 1. Development of simple kits for detecting pesticide residues, fumigants and bioactive compounds.

2. Isolation of microbial pathogens from stored product insects,

3. Preparation of biosurfactants specific to HCH and their characterisation.

Mar 91: 1. Development of synthetic analogues of insect pheromones.

2. Effect of volatile factors derived from storage fungi on their breeding.

3. Development of protocols for safety evaluation of bioactive compounds.

Jun 91: 1. Commercial disinfestation trials with carbon dioxide, nitrogen and dry ice for packed foods and plantation products.

2. Development of microbial formulations (Agrocure) based on plant wastes and their application.

3. Pilot scale production of natural pheromone formulations.

4. Evolving prophylactic diets for pesticide amelioration in animal tissues..

Sep 91: 1. Biophysical methods for monitoring pest infestations.

2. Use of neem extracts as cynergists in pyrethrin formulations.

3. Interaction between fumigants and food constituents relating to safety and organoleptic quality.

Dec 91: 1. Pilot scale trials on controlled atmosphere storage in silos and unit-packed commodities in gunny bags.

2. Fermentation parameters and pilot plant production of HCH degrading Pseudomonas.

3. Neurobehavioural and toxicological responses of bioactive compounds.

Mar 92: 1. Screening and selection of chromogenic reagents for pesticide residue detection.

2. Solid-state fermentation of pesticide abatement agent and biopesticide producer.

3. Characterisation and evaluation of pheromones from Lassioderma cericarne and Rhyzopertha dominica.

(Rs.in Lakhs)

| Budget Estimate: | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 2.25 | 2.50 | 4.75 |
| Recurring | 8.00 | 6.50 | 14.50 |
| Capital | - | - | - |
| Total: | 10.25 | 9.00 | 19.25 |

Project No.3 (Fruits, Vegetables & Plantation Crops): DEVELOPMENT OF TECHNOLOGY PACKAGES FOR THE POST-HARVEST HANDLING AND STORAGE OF ONIONS AND POTATOES AT FARM LEVEL.

Leader: Dr.P.Narasimham

Objectives:

1. Development of economic farm level storage structures to curtail wastage for onion and potatoes.

Milestones:-

Sep 90: 1. Technology for farm level evaporative cool store for potatoes (10 tonne capacity) with minimum storage loss.

Sep 91: 1. Rural house hold level evaporative cool store chamber to store 100-120 kg potatoes.

Mar 92: 1. Model storage structures for farm level storage of onions with minimum storage loss to store 300-400 kg onions.

Budget Estimate:

(Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 1.09 | 1.18 | 2.27 |
| Recurring | 0.80 | 0.70 | 1.50 |
| Capital | 1.10 | 1.11 | 2.21 |
| Total: | 2.89 | 2.98 | 5.98 |

Project No.4 (Cereal Science and Technology): IMPROVEMENT IN PROCESSING SYSTEMS, IDENTIFICATION OF CELLULAR AND SUBCELLULAR DETAILS TO ESTABLISH QUALITY BASES FOR TECHNOLOGICAL BENEFICIATION, ENERGY SAVING AND PRODUCT FORMULATIONS.

Leader: Dr.S.Z.Ali

Objectives:

1. To develop new processes and improve the quality and efficiency in respect of quick cooking rice, cereal-based noodles and brown rice parboiling; mapping of morphological, structural and chemical parameters influencing shelling and milling of cereals and grain hardness in sorghum; formulation of health foods from malted, parboiled and germinated cereals and designing and fabrication of improved grain processing equipments like roaster, flaker, puffing and milling units.

Milestones:-

Jun 90: 1. Optimization of processing conditions for quick cooking rice at laboratory-scale level.

2. Identifying steeping and germination characteristics of wheat varieties desirable for the best diastatic activity of their mals.

Sep 90: 1. Optimization of process variables for rice based noodles.

2. Developing standard sensory and objective tests for judging Mudde quality of brown and white ragi.

Dec 90: 1. Fabrication of small-scale grain flaker and roaster units.

Mar 91: 1. Mapping of cell wall and protein characteristics associated with grain hardness and fungal infestation in sorghum.

2. Development of rice-based noodle formulations and their quality evaluation.

Jun 91: 1. Making blends of malted, parboiled and popped wheat with vegetable protein to formulate health foods.

Sep 91: 1. Quality characterization of quick cooking rice and scaling up the process to pilot plant level.

2. Mapping of parameters influencing energy saving and efficiency during shelling and milling of paddy.

Dec 91: 1. Identifying varietal and processing parameters for production of good quality parboiled rice from brown rice..

Mar 92: 1. Fabrication and testing of grain puffing unit and dry maize mill.

Budget Estimate:

| | (Rs.in Lakhs) 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 12.00 | 14.40 | 26.40 |
| Recurring | 3.00 | 3.50 | 6.50 |
| Capital | 18.71 | 7.55 | 26.26 |
| Total: | 33.71 | 25.45 | 59.16 |

## Thrust Area No.3

## QUALITY STANDARDS AND FOOD SAFETY

Project No.1 (Food Chemistry): METABOLIC EFFECTS OF SPICES.

Leader: Dr.N.Chandrashekhara

Objectives:

1. To explore influence of spices in preventing gall stone formation.

2. Mango ginger - its role in lipid metabolism.

3. To explore whether the beneficial effects of spices would be mediated through the adrenal cortex.

Milestones:-

Jun 90: 1. Preparation of freeze-dried mango ginger and of curcumin-free portion.

Sep 90: 1. Screening of two spices at 3 doses for prevention/reduction of gall stones in mice.

Dec 90: 1. Data on effect of chosen spices on adrenal composition.

2. Hypolipidemic efficacy of curcumin free portion of mango ginger.

Mar 91: 1. Induction of cholesterol gall stones in hamsters.

Jun 91: 1. Influence on mineralocorticocids.

2. Mango ginger and absorption of lipids.

Sep 91: 1. Evaluation of parameters involved in gall stone formation.

Dec 91: 1. Influence on glucocorticoids.

Mar 92: 1. Dose response study in prevention/reduction of gallstones in hamsters.

2. Mango ginger and bile secretion and composition.

Budget Estimate:

(Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 2.30 | 2.40 | 4.70 |
| Recurring | 0.50 | 0.50 | 1.00 |
| Capital | - | 0.45 | 0.45 |
| Total: | 2.80 | 3.35 | 6.15 |

Project No.2 (Nutrition & Food Safety): ROLE OF DIETARY FATS, FOOD ADDITIVES AND CONTAMINANTS ON IMMUNOLOGICAL/PHYSIOLOGICAL/MUTAGENIC/CARCINOGENIC EFFECT IN ANIMALS, AS MODEL.

Leader: Dr.S.Venkat Rao

Objectives:

1. Understanding the nutritional and toxicological roles of food components, additives and contaminants aimed at ensuring safety of food.

Milestones:-

Jun 90:
1. Biochemical characterisation of turmeric peptide as anticlastogen binding to DNA.
2. Methodology for estimation of aluminium in food and biological samples.
3. Data on heavy metals in tea from different regions.
4. Lipid composition of secondary fats (RBO and Soya oil).
5. Cell-mediated immunological reactions of lymphocytes from spleen, thymus and bloof after treatment.

Sep 90:
1. Testing for preferential binding of the peptide to any site in DNA.
2. Data on effect of oryzanol from RBO on SCE-inducing activity of cyclophosphamide.

3. Methodology for estimation of manganese in food and biological samples.

4. Data on metal complexes in tea from different sources.

5. Data on activity of membrane enzymes (alkaline phosphatose, $Na^+K^+$ ATPase, 5'-nucleotidase).

Dec 90:

1. Data on effect of oryzanol from RBO on SCE-inducing activity of known mutagens.

2. Data on distribution of Al and Mn in different tissues of rats fed regional diets.

3. Data on effect of gums <u>in vitro</u> on release functions in platelets.

Mar 91:

1. Computer modelling of lymphocyte - clastogenic factor binding to DNA.

2. Data on heavy metals in cereals, millets and pulses.

3. Assessment of membrane enzymes in resting and activated macrophages to ccorrelate with their functions.

Jun 91:

1. Characterisation of turmeric peptide antioxidant at cellular level.

2. Data on Mn content of local diets.

3. Data on effect of gums on platelet aggregation <u>in vivo</u>.

Sep 91:

1. Estimation of clastogenic action on lymphocyte factor - Data on components of fuel smoke.

2. Screening of vegetables of cucurbitaceae family for antimutagenic activity.

3. Data on heavy metals in milk, meat, tinned products and water.

4. Data on effect of turmeric and gums <u>in vivo</u> on release reactions in platelets.

Dec 91:

1. Characterisation of DNA fragments produced by lymphocyte clastogenic factor.

2. Identification of active fractions from vegetables.

Mar 92: 1. Selective cloning of turmeric peptide antipromotion resistant and sensitive cells.

2. Characterisation of active fractions from vegetables.

3. Data on <u>in vitro</u> effect of aluminium on platelets

Budget Estimate:

| | (Rs. in Lakhs) 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 5.65 | 6.40 | 12.05 |
| Recurring | 5.80 | 7.40 | 13.20 |
| Capital | 11.40 | 7.75 | 19.15 |
| Total: | 22.85 | 21.55 | 44.40 |

<u>Project No.3</u> (Microbiology & Sanitation): DEVELOPMENT OF ELISA & RIA TECHNIQUES FOR ESTIMATION OF MICROBIAL TOXINS.

Leader: Dr(Mrs). T.Shantha

Objectives:

1. To ensure hygiene in food processing and microbiological safety of food products.

Milestones:-

Jun 90: 1. To procure standard microbial toxins, conjugates (aflatoxin and staphylococcal toxins).

Mar 91: 1. To raise high titre antisera by mocculating into rabbit: (a) aflatoxin, (b) staphylococcal toxin.

Jun 91: 1. To study the efficacy of different food materials - milk, khoa, laddu, cooked rice, sambar and spiced foods (raw and processed) to support growth of organism and production of microbial toxins at R.T. and 37°C by using toxigenic isolates.

Sep 91: 1. To study changes occurring to aflatoxin during processing of traditional foods (chikias, maize, roti).

Dec 91: 1. Extrapolate the data obtained to ensure food hygiene.

Mar 92: 1. To develop diagnostic kits for (a) aflatoxin, (b) staphylococcal toxins.

Budget Estimate:

(Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 1.27 | 1.30 | 2.57 |
| Recurring | 0.60 | 0.60 | 1.20 |
| Capital | 6.05 | 0.05 | 6.10 |
| Total: | 7.92 | 1.95 | 9.87 |

Project No.4 (Autotrophic Cell Culture): PRODUCTION OF HIGH VALUE SECONDARY METABOLITES FOR FEED APPLICATION BY PLANT CELL CULTURES.

Leader: Dr.L.V.Venkataraman

Objectives:

1. To develop stigma like structures (proliferation) from ovary culture of saffron.

2. To produce crocin (food colour) from tussue cultures of Gardenia jasminoides.

3. To set standards for qualitative and quantitative analysis of saffron (i.e. for crocin, picrocrocin and Saffranal).

4. To scale up immobilized cell and placenta of capsicum for continuous capsaicin production in a column reactor.

5. To improve the yields of pyrethrin production by fungal elicitors and scale up of pyrethrum cultures to 10/l level in airlift bioreactor.

Milestones:-

Mar 91: 1. Development of suitable cell lines of saffron, pyrethrin and capsicum, and associated production media.

Mar 92: 1. Selection of cell lines with high productivity by suitable biochemical markers.

Budget Estimate: (Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 1.50 | 1.58 | 3.08 |
| Recurring | 1.00 | 1.00 | 2.00 |
| Capital | 6.80 | 1.20 | 8.00 |
| Total: | 9.34 | 3.74 | 13.08 |

Project No.5 (Autotrophic Cell Culture): PRODUCTION OF FOOD ADDITIVES AND COMMERCIALLY IMPORTANT COMPOUNDS BY GENETIC MANIPULATION AND BIOTRANSFORMATIONS IN ALGAE.

Leader: Dr.L.V.Venkataraman

Objectives:

1. Strain selection for high beta-carotene and phycocyanin producing cell lines.

2. Selection of fast growing algal cells.

3. Protoplast fusion for high beta-carotene/phycocyanin producing algal cells with improved growth rates.

4. Biotransformation of low value compounds to high value products in in vitro and in vivo systems.

Milestones:-

Jun 90: 1. Development of protoplast isolation methods for Spirulina.

Sep 90: 1. Development of plating techniques for mutant selection.

Dec 90: 1. Identification of auxotrophic markers for protoplast fusion studies.

Mar 91: 1. Identification of best strains by mutation studies using chemical and physical mutagens.

Sep 91: 1. Identification of key enzymes for beta-carotene and phycocyanin.

Dec 91: 1. Identificaation of specific mRNAs.

Mar 92: 1. Construction of cDNA for gene amplification studies.

(Rs.in Lakhs)

| Budget Estimate: | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 0.60 | 0.78 | 1.38 |
| Recurring | 1.70 | 1.70 | 3.40 |
| Capital | 3.70 | 2.70 | 6.40 |
| Total: | 6.09 | 5.09 | 11.18 |

Project No.6 (Process Engineering & Plant Design): DEVELOPMENT OF SEPARATION TECHNIQUES.

Leader: Shri P.Ramakrishna

Objectives:

1. To develop suitable techniques for separation of (i) black specs from mango pulp (Totapuri), (ii) sand from mango pulp, and (iii) rat excreta from black pepper.

Milestones:-

Mar 91: 1. Evaluation of engineering properties of the materials involved.

Sep 91: 1. Development of separation techniques.

Mar 92: 1. Testing of equipment.

(Rs.in Lakhs)

| Budget Estimate: | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 1.10 | 1.30 | 2.40 |
| Recurring | 0.50 | 0.50 | 1.00 |
| Capital | 5.00 | 7.00 | 12.00 |
| Total: | 7.60 | 7.80 | 15.40 |

Project No.7 (Process Engineering & Plant Design): DESIGN AND DEVELOPMENT OF SUPERCRITICAL FLUID EXTRACTION (SCFE) SYSTEM FOR HIGH VALUE PRODUCTS.

Leader: Shri B.Manohar

Objectives:

1. Process and system design for indigenous SCPE technology capable of handling a range of high value products.

Milestones:-

Jun 90: 1. Screening of raw-materials for extraction, pre-treatment; feasibility trials.

Sep 90: 1. Phase equilibria tudies for solubility determination; chemical process design data generation.

Dec 90: 1. Survey for identification of indigenous individual components in the SCFE system and procurement of the above.

Mar 91: 1. Determination of heat and mass transfer coefficiients; effect of process parameters on mass transfer rates.

Jun 91: 1. Chemical and sensory quality analyses of products.

Sep 91: 1. Optimization of process and modelling.

Dec 91: 1. System design (selection of equipment and layout); design of critical mechanical components like pressure vessels, heat exchangers (collaboration with BHPV/CMERI) and fabrication.

Mar 93: 1. Fabrication, assembly and test runs.

Budget Estimate: (Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 1.00 | 1.20 | 2.20 |
| Recurring | 0.50 | 0.50 | 1.00 |
| Capital | 3.00 | 7.00 | 10.00 |
| Total: | 4.50 | 8.70 | 13.20 |

Project No.8 (Sensory Analysis & Consumer Acceptance): DEVELOPMENT AND STANDARDISATION OF SENSORY AND INSTRUMENTAL MEASURES FOR PRODUCT EVALUATION.

Leader: Ms.D.Rajalakshmi

Objectives:

1. Development of methods for (a) sensory quality analysis, (b) instrumental analysis of aroma and texture.

2. Functional relationships between sensory and instrumental measures.

Milestones:-

Sep 90: 1. Development/adaptation of suitable sensory analysis methods for effective use in products/ processes optimizaation with respect to sensory quality of the resultant product.

Dec 90: 1. Completion of the work on aroma profiling and final grading of masala paste formulations and their performance in finished products with respect to sensory quality.

Jun 91: 1. Completion of the work on texture profiling of Bombay Halwa and the modelling of predictive functional relationships.

2. Texture profiling of one more traditional product and the study of functional relationships among the different attributes.

3. Analysis of products from other area/industries.

Sep 91: 1. Sensory analysis of products from other areas will be undertaken as projected under the respective projects.

Mar 92: 1. Products from industries will be analysed in accordance with their requirement.

Budget Estimate: (Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 2.01 | 2.25 | 4.26 |
| Recurring | 0.85 | 0.85 | 1.70 |
| Capital | 4.30 | 0.05 | 4.35 |
| Total: | 7.16 | 3.15 | 10.31 |

Project No.9 (Food Packaging & Distribution Engineering): MODIFICATION OF THE PROCESSING PARAMETERS/TECHNIQUES FOR PACKING PROCESSED AND SEMIPROCESSED FOOD PRODUCTS IN GLASS CONTAINERS.

Leader: Dr.M.Mahadevaiah

Objectives:

1. To screen the glass containers and their closures at present in use for non-processed food products for their suitability for processing.

2. To modify the processing methods and conditions for glass bottles with different food products and to suggest modifications to the existing facilities.

3. To explore the possibility of developing light weight heat sterilisable glass bottles in collaboration with CGCRI and glass bottles manufacturers.

Milestones:-

Jun 90: 1. Screening of existing glass bottles and closures for processing of food products.

Sep 90: 1. Modifications of the processing methods.

Dec 90: 1. Packing of a few processed products with modified procedure.

Mar 91: 1. Shelf-life studies of the packed products.

Jun 91: 1. Procurement of light weight glass bottles and their screening.

Sep 91: 1. Packing of a few food products in light weight glass bottles.

Mar 92: 1. Completion of shelf-life studies of products packed in light weight glass bottles.

2. Writing of consolidated report.+

Budget Estimate:

| | (Rs.in Lakhs) 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 1.60 | 1.69 | 3.29 |
| Recurring | 0.195 | 0.185 | 0.38 |
| Capital | 0.75 | 0.45 | 1.20 |
| Total | 2.545 | 1.325 | 4.87 |

Project No.10 (Food Packaging & Distribution Engineering): DEVELOPMENT OF EDIBLE PACKAGING MATERIALS BASED ON AMYLOSE AND STARCHES.

Leader: Dr.R.A.N.Murthy

Objectives:

1. To modify amylose with functional compounds such as acid anhydrides, acyl halides, alkylene carbonates etc., and charcterisation.

2. To modify other materials such as corn starch, cellulose and dextrins.

3. Evaluation of the above.

4.5
5
6.30

Milestones:-

Dec 90: 1. Selection of amylose and other materials of proper molecular weight and viscosity.

Mar 91: 1. Modifications with functional organic compounds.

Jun 91: 1. Characterisaation of functional groups in modified materials.

Sep 91: 1. Evaluation of modified materials.

Budget Estimate:

| | (Rs.in Lakhs) 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 1.35 | 1.36 | 2.71 |
| Recurring | 11.67 | 1.73 | 13.40 |
| Capital | 0.32 | 0.37 | 0.69 |
| Total: | 11.67 | 1.73 | 16.80 |

Project No.11 (Food Packaging & Distribution Engineering): DESIGN AND DEVELOPMENT OF CONSUMER FLEXIBLE PACKAGES FOR CONVENIENCE FOODS AND DATA GENERATION ON FLEXIBLE PACKAGING MATERIALS.

Leader: Shri.N.Balasubramanyam

Objectives:

1. Design and development of functional cost effective consumer packages for saturated and unsaturated oils, convenience foodss and oxygen sensitive foods.

2. Evaluation of newer flexibles and semi-rigid plastic containers for their suitability for processed foods.

3. Development of shelf-life prediction methods for packaged foods sensitive to moisture, oxygen and odour, based on the product characteristics and packaging materials.

Milestones:-

Jun 90: 1. Procurement of food packaging materials like films, laminates and coextruded films. Collection of literature on deteriorative characteristics of oxygen and odour sensitive foods.

Sep 90: 1. Design of functional, cost-effective unit consumer packages for unsaturated oils like sesame, niger, safflower, Sunflower oils and saturated coconut oil. Evaluation of barrier and physico-chemical properties of packaging materials.

Dec 90: 1. Development of methods for evaluation of odour permeability of packaging materials at different permanent concentrations.

Mar 91: 1. Development of shelf-life predictive methods for oxygen sensitive foods and evaluation of storage behaviour of above oils.

Jun 91: 1. Computer simulation of shelf-life prediction methods. Evaluation of properties of food packaging.

Sep 91: 1. Development of packages and storage studies of convenience foods like chapathies, poori, Indian sweets and saavouries.

Dec 91: 1. Development of packages and storage studies of spice products and ready-to-serve fruit beverages. Evaluation of properties of packaging materials.

Mar 92: 1. Consolidation of data generated and correlation of shelf-life of packaged flavoured foods with barrier properties of materials.

Budget Estimate:

(Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 2.80 | 3.00 | 5.80 |
| Recurring | 0.70 | 0.50 | 1.20 |
| Capital | 2.00 | 1.50 | 3.50 |
| Total: | 5.50 | 5.00 | 10.50 |

Project No.12 (Microbiology & Sanitation): STUDIES ON ANTOGONISTIC BACTERIA AND THEIR METABOLITES FOR PRESERVATION OF FOODS.

Leader: Shri N.Keshava

Objectives:-

1. To develop an alternative/supportive method of food preservation.

Milestones:-

Jun 90: 1. Isolation of lactic, spoilage and pathogenic microflora in relevant foodstuffs; selection of antagonistic microflora.

Sep 90: 1. In vitro studies on antagonistic vs. natural isolates of spoilage and pathogenic microbes.

2. Isolation of inhibitory metabolites.

Dec 90: 1. In vivo studies on antagonism with relevant foodstuffs.

Mar 91: 1. Studies on improvement of antagonism with additives, cultural conditions, synergistic growth, etc. (in vitro).

Jun 91: 1. In vivo trials on foodstuffs for improved shelf-life.

Sep 91: 1. In vivo trials on foodstuffs with synergistic antagonists.

Dec 91: 1. In vivo trials on foodstuffs with optimisation of additives and synergistics of antagonism.

Mar 92: 1. Consumer trials with naturally preserved foods.

Budget Estimate: (Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 2.00 | 2.00 | 4.00 |
| Recurring | 3.55 | 0.10 | 3.65 |
| Capital | 1.35 | 1.25 | 2.60 |
| Total: | 6.90 | 3.35 | 10.25 |

## Thrust Area No.4:

## TARGETTED NUTRITION FOR SPECIFIC GROUPS

Project No.1 (Food Chemistry): CHEMICAL STUDIES ON THE CARBOHYDRATES OF FUNCTIONAL AND BIOLOGICAL IMPORTANCE.

Leader: Dr.R.N.Tharanathan

Objectives:

1. To understand the structure of carbohydrates of cereals, legumes and milk in relation to their function - digestibility, cooking patterns and biological functions.

Milestones:-

Jun 90: 1. Isolation and fractionation of starches from black gram, horse gram, ragi and wheat.

Sep 90: 1. Red gram varieties having differences in cooking time will be milled to dhal and study of their chemical composition; isolation and chemical compositional studies of oligosaccharides from buffalo colostrum.

Dec 90: 1. Isolation and chemical characterization of water-soluble glucans from rice, ragi, jowar and wheat.

Mar 91: 1. Isolation and chemical characterization of water-soluble gums and pectins from a few varieties of red gram; purification of oligosaccharides from colostrum.

Jun 91: 1. Localisation of beta-1,3 glucans by histochemical studies and study of their homogeneity, and molecular weight determination.

Dec 91: 1. Characterization, *in vitro* digestibility and biological activity of glucans.

Mar 92: 1. Further studies on the chemical nature of functionally important polysaccharides from red gram; study of the biological activity of colostrum oligosaccharides.

(Rs. in Lakhs)

| Budget Estimate: | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 2.24 | 2.30 | 4.54 |
| Recurring | 0.50 | 0.75 | 1.25 |
| Capital | 1.05 | - | 1.05 |
| Total: | 3.79 | 3.05 | 6.84 |

Project No.2 (Food Chemistry): INTERACTION OF SPECIFIC LIGANDS WITH PROTEINS/ENZYMES FOR OIL BEARING RAW MATERIALS.

Leader: Dr.V.Prakash

Objectives:

1. To obtain basic information on the mechanism of inactivation of lipases by both chemical and physical means.
2. To work out rational method for removal of acacetin (coloured component) of Sunflower seed from its proteins.

Milestones:-

Mar 92: 1. Methods to eliminate antinutritional substances in oilseeds/oil bearing materials.

(Rs. in Lakhs)

| Budget Estimate: | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 0.95 | 0.98 | 1.93 |
| Recurring | 0.10 | 0.10 | 0.20 |
| Capital | - | - | - |
| Total: | 1.08 | 1.08 | 2.13 |

Project No.3 (Food Chemistry): THERMAL STABILIZATION OF PROTEINS WITH PARTICULAR REFRENCE TO ENZYMES OF INDUSTRIAL IMPORTANCE.

Leader: Dr.V.Prakash

Objectives:

1. To obtain mechanism of stabilisation of enzymes in sugar and glycerol type solvents.

2. To bring about thermal stability of enzymes such as glucose isomerase, and bacterial amylase and glucoamylase such that at higher temperatures of their use one can expect faster rate of reaction and higher yield of end-product with less enzyme.

Milestones:-

Mar 92: 1. To enhance thermal stability of enzymes and protein sweetners.

Budget Estimate:

(Rs. in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 0.90 | 0.95 | 1.85 |
| Recurring | 0.10 | 0.10 | 0.20 |
| Capital | 0.50 | - | 0.50 |
| Total: | 1.50 | 1.05 | 2.55 |

Project No.4 (Nutrition & Food Safety): SPECIAL FOODS FOR INFANTS AND CHILDREN, AND THEIR THEALTH AND NUTRITIONAL STATUS.

Leader: Dr.S.Venkat Rao

Objectives:

1. Formulation of nutritious food products to ameliorate metabolic disorders.

2. To obtain clear understanding of the relation between nutritional status and antistreptolysin (ASL) titres in children with acute rheaumatic fever.

Milestones:-

Jun 90: 1. Formulation and development of low bulk foods based on cereals.

2. Nutritional status and ASL levels of malnourished children (Gr.I).

Sep 90: 1. Treatment of nutritional deficiency in Gr.I children and ASL levels in these children.

Dec 90: 1. Nutritional quality assessment of low bulk foods with animals.

2. Nutritional status and ASL levels of malnourished children (Gr.II).

Jun 91: 1. Nutritional quality assessment of low bulk foods with malnourished children.

2. Nutritional status and ASL levels of malnourished children (Gr.III).

Sep 91: 1. Development of infant food with bifidus factor.

Mar 92: 1. Infant feeding trials on infant food with bifidus factor.

2. Effect of long-term nutritional correction on ASL levels of Gr.III children/trials with well- and undernourished rats with bacterial toxin (streptolysin).

Budget Estimate: (Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 2.35 | 2.75 | 5.10 |
| Recurring | 1.70 | 1.80 | 3.50 |
| Capital | 1.70 | 1.70 | 3.40 |
| Total: | 5.75 | 6.25 | 12.00 |

Project No.5 (Fruits, Vegetables & Plantation Crops): CONVENIENCE AND SHELF STABLE PRODUCTS BASED ON FRUITS AND VEGETABLES.

Leader: Shri B.S.Ramachandra

Objectives:

1. To develop technologies for the preparation of shelf stable vegetables in flexible packages.

2. To develop convenience ready mix dry formulations like vegetable pickles, spiced jams and jellies, vegetable curry mixes.

3. To develop frozen fruit and vegetable products.

4. To develop blended fruits and vegetable juice beverages.

Milestones:-

Dec 90: 1. Process for shelf stable vegetables in flexible pouches by lactic fermentation.

2. Ready mix formulations for spiced jams and jellies and tomato ketchup powder.

Jun 91: 1. Process for quick cooking vegetable curry dry mixes. Process for convenience frozen fruit and vegetable products.

Dec 91: 1. Process for blended beverages based on fruits and vegetables.

Mar 92: 1. Process for dehydrated mixed vegetable pickles.

(Rs.in Lakhs)

| Budget Estimate: | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 2.06 | 2.18 | 4.24 |
| Recurring | 0.75 | 0.75 | 1.50 |
| Capital | 2.00 | - | 2.00 |
| Total: | 4.81 | 2.93 | 7.74 |

Project No.6 (Fruits, Vegetables & Plantation Crops): FRUIT JUICE CLARIFICATION AND CONCENTRATION BY REVERSE OSMOSIS AND PULPS BY ENZYMATIC PROCESS.

Leader: Dr.A.M.Nanjunda Swamy

Objectives:

1. Setting up of laboratory model RO and UF units.

2. Determination of optimum conditions for clarification and concentration of selected fruit juices like apple, orange, pineapple and grapes.

3. Studies on effect of RO on important constituents and sensory qualities of fruit juices and storage behaviour.

4. Determination of optimum conditions for partial pectin hydrolysis and concentration of fruit pulps like mango, guava and papaya.

5. Sensory evaluation of pulp concentrates during storage.

Milestones:-

Mar 91: 1. Procurement and setting up of RO and UF units, testing and standardization.

2. Process for enzyme clarified fruit pulps - mango, guava and banana.

Mar 92: 1. Generation of technical data on clarification and concentration of fruit juices by UF & RO - mango, guava and banana.

Budget Estimate: (Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 2.06 | 2.12 | 4.18 |
| Recurring | 0.14 | 0.18 | 0.32 |
| Capital | 3.20 | - | 3.20 |
| Total: | 5.40 | 2.30 | 7.70 |

Project No.7 (Experimental Animal Production Facility): DIET FORMULATIONS OF VARIOUS LABORATORY ANIMALS AND REPLACEMENT OF GROUNDNUT OIL WITH RICE BRAN OIL IN THE ANIMAL DIETS.

Leader: Dr.P. Saibaba

Objectives:

1. To formulate diets for various laboratory animals maintained in the animal house with locally available raw materials so as to minimise the cost of feed.

2. To replace groundnut oil with rice bran oil in the animal diets and to study the effects of rice bran oil, palm oil on the reproduction, growth, prenatal and post-natal effects in rats (embryological and teratological studies).

Milestones:-

Jun 90: 1. Proximate analysis of various cereals and pulses that are to be used in the diets of animals.

Sep 90: 1. Formulation of diets for various animals maintained in the animal house. The proximate analysis of the diets.

Sep 91: 1. Completion of reproductive performance studies. Tetratological studies.

Dec 91: 1. Histological examination of tissues of experimental animals.

Mar 92: 1. Histological examination of tissues - continued.

Budget Etimate:

(Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 0.25 | 0.30 | 0.55 |
| Recurring | 0.20 | 0.25 | 0.45 |
| Capital | 0.20 | 0.30 | 0.50 |
| Total: | 0.65 | 0.85 | 1.50 |

## Thrust Area No.5:

## TECHNOLOGIES FOR BOOSTING EXPORT EARNINGS

Project No.1 (Fruits, Vegetables & Plantation Crops): ECONOMIC UTILIZATION OF FRUIT PROCESSING WASTES - AROMA RECOVERY FROM RESIDUES OF MANGO, GUAVA AND APPLE PROCESSING.

Leader: Shri B.S.Ramachandra

Objectives:

1. To evaluate the quality and quantity of aroma volatiles available in the fruit wastes.

2. To evolve technologies for efficient recovery of aroma from the fruit wastes.

3. To utilize aroma concentrates recovered from the fruit wastes for flavouring food formulations.

Milestones:-

Mar 91: 1. A process for aroma recovery from mango and apple wastes.

Mar 92: 1. A process for aroma recovery from guava waste. Products flavoured with aroma concentrates from fruit wastes - beverages, dairy products.

Budget Estimate: (Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 1.30 | 1.50 | 2.80 |
| Recurring | 0.50 | 0.50 | 1.00 |
| Capital | 1.00 | - | 1.00 |
| Total: | 2.80 | 2.00 | 4.80 |

Project No.2 (Fruits, Vegetables & Plantation Crops): IMPROVEMENTS IN PROCESSING AND PREPARTION OF VALUE-ADDED PRODUCTS FROM SPICES, COFFEE, TEA, COCOA AND TECHNOLOGY FOR NATURAL COLORANTS.

Leader: Dr.M.L.Shankaranarayana

Objectives:

1. Improved and new spice products for the domestic and export market.

2. Preparation of chlorophyll, caramel and beta-carotene colorants from natural sources.

3. Alcohol as an alternate solvent for spice extractives.

4. Improvements in wet processing of coffee.

5. Extraction of cocoa butter from cocoa waste.

6. Preparation of stabilized flavoured teas, tea mixes and tea concentrates.

7. Decaffeination of coffee using safe solvents.

8. Extraction of cashew apple flavour.

9. Development of synthetic pineapple flavour.

Milestones:-

Mar 91: 1. A process for preparation of stabilized flavor teas.

2. Process know-how for cocoa butter from cocoa waste.

3. Ready tea mix formulation for vending machine.

4. A process for decaffeinated tea using safer solvents.

Mar 92: 1. Process for oleoresin extraction from celery, ginger and turmeric using alcohol.

2. Synthetic pineapple and flavour blend.

3. Process know-how for spice mixes for traditional and convenience food.

4. Process for natural food colors - chlorophyll and beta-carotene colors.

5. Process know-how for flavor concentrate from cashew apple.

(Rs.in Lakhs)

| Budget Estimate: | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 6.00 | 6.50 | 12.50 |
| Recurring | - | - | - |
| Capital | 5.50 | 4.50 | 10.00 |
| Total: | 11.50 | 11.00 | 22.50 |

Project No.3 (Fruits, Vegetables & Plantation Crops): POST-HARVEST HANDLING PROCEDURES AND SYSTEMS FOR FRESH FRUITS AND VEGETABLES - MANGO (ALPHONSO AND TOTAPURI) BELL PEPPER, LADY'S FINGER, PEAS AND CAULIFLOWER.

Leader: Shri B.S. Ramachandra

Objectives:

1. Standardization of quality parameters for Totapuri mango, Lady's finger, Bell pepper, Peas and Cauliflower for internal and export trade.

2. Extension of shelf-life under different storage conditions.

3. Wastage assessment and control measures.

4. Container evaluation for internal and export trade.

Milestones:-

Mar 91: 1. Handling procedures and systems for bell pepper, Lady's finger and peas for internal trade.

Mar 92: 1. Handling procedures and systems for two varieties of mango and cauliflower and container standardization for export trade.

(Rs.in Lakhs)

| Budget Estimate: | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 5.03 | 5.44 | 10.47 |
| Recurring | 1.20 | 1.67 | 2.87 |
| Capital | 3.00 | 3.00 | 6.00 |
| Total: | 9.23 | 10.11 | 19.34 |

Project No.4 (Confectionery & Convenfience Foods): DEVELOPMENT OF TECHNOLOGY FOR TRADITIONAL INDIAN CONFECTIONERY.

Leader: Dr.J.V.Prabhakar

Objectives:

1. Determination of optimum ingredients and processing parameters for traditional sweet preparations so as to streamline the processes.

Milestones:-

Sep 90: 1. Process optimization for Mysore Pak.

Mar 91: 1. Process optimization for Bombay Halwa.

Sep 91: 1. Process optimizaation for Jahangir.

Mar 92: 1. Improvement of texture and shelf-life of Burfi; and improvement of product formulation of Jamun.

(Rs.in Lakhs)

| Budget Estimate: | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 1.80 | 1.80 | 3.60 |
| Recurring | 0.10 | 0.10 | 0.20 |
| Capital | 2.50 | 6.90 | 9.40 |
| Total: | 4.40 | 8.80 | 13.20 |

Project No.5 (Confectionery & Convenience Foods): DEVELOPMENT OF TECHNOLOGY FOR TRADITIONAL ADJUNCTS.

Leader: Dr.K.G.Raghuveer

Objectives:

1. Optimization of processing conditions for spices for traditional products - Rasam and Sambar.

Milestones:-

Mar 91: 1. Fixing of processing parameters of spices for rasam/sambar mixes for optimal pungency, colour and aroma.

Dec 91: 1. Completion of storage behaviour of processed mixes.

Mar 92: 1. Development of rasam/sambar mixes based on optimally processed spices.

Budget Estimate: (Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 1.42 | 1.55 | 2.97 |
| Recurring | 0.30 | 0.30 | 0.60 |
| Capital | 4.00 | 8.00 | 12.00 |
| Total: | 5.72 | 9.85 | 15.57 |

## RESEARCH IN EMERGING AREAS

Project No.1 (Food Chemistry): STRUCTURAL AND MOLECULAR BIOLOGICAL INVESTIGATIONS ON ANTINUTRITIONAL OR FUNCTIONALLY ACTIVE PROTEINS FROM CEREALS AND LEGUMES.

Leader: Dr.D. Rajagopal Rao

Objectives:

1. To determine the physico-chemical basis for the elastic property of high molecular weight of wheat gliadin.

2. To correlate at the molecular level the structure-function relationship of the field bean lectin and the horse gram protease inhibitor.

Milestones:-

Jun 90: 1. Isolation of high mol. wt. gliadins and glutenins from wheat varieties Sonalika and HI-977.

Sep 90: 1. Mol. wt. determination of the covalently bonded proteins and determination of their sub-unit composition.

Dec 90: 1. Isolation of similar sub-units from glutenin and gliadin and determination of their amino acid composition.

2. Field bean lectin and Horse gram protease inhibitor.

Jun 90: 1. The field bean lectin and Horse gram inhibitor will be purified and checked for homogeneity by HPLC methods.

Sep 90: 1. The proteins will be cleared by chemical and enzymatic methods and digests fractioned by gel filtration and HPLC methods.

Mar 91: 1. The nature of the disulfide bridges in the Horse gram inhibitor will be determined by parformic and oxidation, separation of cysteic acid containing peptides and sequencing the same.

Jun 91: 1. The total poly (A) mRNA will be isolated from developing seeds of field bean and Horse gram.

Sep 91: 1. The poly (A) mRNA will be reverse transcribed and subsequently the second DNA strand will be synthesised to generate CDNA. This will be ligated into expression vector and the host JM 103 will be transformed.

Dec 91: 1. DNA from seed embryo will be prepared from field bean and Horse gram and digested with restriction enzymes like BAM HI and PST I. The digests will be cloned into lambda gt vector.

Mar 92: 1. The lectin and inhibitor clones will be identified using labelled synthetic DNA probe. The clones will also be screened for the presence of the lectin and inhibitor polypeptide using immunological methods.

Budget Estimate: (Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 3.00 | 2.40 | 5.40 |
| Recurring | 2.50 | 2.50 | 5.00 |
| Capital | 7.90 | - | 7.90 |
| Total: | 13.40 | 4.90 | 18.30 |

Project No.2 (Food Chemistry): ANALYSIS OF PROCESSED FOOD FLAVOURS AND SYNTHESIS OF FLAVOURANTS.

Leader: Dr.K.N. Gurudutt

Objectives:

1. Development of synthetic processes for some of the food flavourants, making use of the byproducts of food industry (eg. carvone, 1,4-cinole, vanillin, caryophyllone oxide, heliotropin and sulphur flavours of onion, garlic and asafoetida.

Milestones:-

Jun 90: 1. Literature survey.

2. Standardisation of flavour entrapping and GC-MS analytical techniques.

3. Synthetic routes to carvone.

Sep 90: 1. Study of the cooked rice and Idli flavours.

2. Curry leaf essential oil analysis.

3. Synthesis of 1,4-cineole.

Dec 90: 1. Study of the cooked tur dal flavour.

2. Chemical composition of the essential oil of of Centella aromatica.

3. Synthesis of beta-carphyllene oxide.

Mar 91: 1. Study of Dhokla flavour.

2. Chemical study of Moringa oleifera.

3. Synthesis of heliotropin.

Sep 91: 1. Study of puffed Bengal gram flavour.

2. Chemical study of Sesbania grandiflora.

3. Synthesis of vanillin - 1.

Dec 91: 1. Study of Nan flavour.

2. Synthesis of Vanillin - 2.

Mar 92: 1. Synthesis of sulphur flavour compounds of onion, garlic and asafoetida.

2. Creation of a computer data base on the flavours studied under the project.

Budget Estimate:

(Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 2.30 | 2.70 | 5.00 |
| Recurring | 1.00 | 1.00 | 2.00 |
| Capital | 5.00 | 4.00 | 9.00 |
| Total: | 8.30 | 7.70 | 16.00 |

Project No.3 (Food Chemistry): INCLUSION COMPOUNDS OF CYCLODEXTRINS IN FOOD RESEARCH.

Leader: Dr.S. Divakar

Objectives:

1. To work out various means of exploiting the complexation abilities of beta-cyclodextrin in food applications at the laboratory-scale level.

2. Chemically modifying cyclodextrins to explore some of the processes useful to food industry.

3. To produce value-added compounds used in food, based on reactions with guest molecules.

4. Structural studies with inclusion compounds.

Milestones:-

Jun 90:
1. Structural studies with food additives.
2. Working out procedures for preparing a polymer support with beta-cyclodextrin.
3. Carry out some reactions on guest molecules.

Sep 90:
1. Structural studies with food additives.
2. Working out procedures for preparing a polymer support with beta-cyclodextrin.
3. Carry out some reactions on guest molecules.

Dec 90:
1. Structural studies with food additives.
2. Working out procedures for preparing a polymer support with beta-cyclodextrin.
3. Carry out some reactions on guest molecules.

Mar 91:
1. Working out procedures for preparing a polymer support with beta-cyclodextrin.
2. Carry out some reactions on guest molecules.

Jun 91:
1. Working out procedures for preparing a polymer support with beta-cyclodextrin.

2. Make use of the polymer support to investigate one or more of the (i) resolution of recemic mixtures of enantiomers of value-added compounds, (ii) debittering of fruit juices. and (iii) carry out some reactions on guest molecules.

3. Carry out reactions on guest molecules to produce value-added compounds.

Sep 91:

1. Make use of the polymer support to investigate one or more of the (i) resolution of recemic mixtures of enantiomers of value-added compounds, (ii) debittering of fruit juices, and (iii) carry out some reactions on guest molecules.

2. Carry out reactions on guest molecules to produce value-added compounds.

Dec 91:

1. Make use of the polymer support to investigate one or more of the (i) resolution of recemic mixtures of enantiomers of value-added compounds, (ii) debittering of fruit juices, and (iii) carry out some reactions on guest molecules.

2. Carry out reactions on guest molecules to produce value-added compounds.

Mar 92:

1. Make use of the polymer support to investigate one or more of the (i) resolution of recemic mixtures of enantiomers of value-added compounds, (ii) debittering of fruit juices, and (iii) carry out some reactions on guest molecules.

2. Carry out reactions on guest molecules to produce value-added compounds.

(Rs.in Lakhs)

| Budget Estimate: | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 0.84 | 0.85 | 1.69 |
| Recurring | 0.55 | 0.35 | 1.10 |
| Capital | - | - | - |
| Total: | 1.39 | 1.40 | 2.79 |

Project No.4 (Food Chemistry): APPLICATION OF PERMEABILIZED WHOLE MICROBIAL CELLS (YEAST) FOR BIO-CATALYSIS.

Leader: Dr.S.G. Bhat

Objectives:

1. To characterize lactase (beta-galactosidase) activity of glutaradehyde stabilized permeabilized yeast cells.

2. To immobilize the glutardehyde stabilized permeabilized yeast cells and develop a continuous bio-reactor system to hydrolyse lactose in milk.

3. To exploit alcohol dehydrogenase activity of permeabilized baker's yeast to produce flavour compounds.

Milestones:-

Jun 90: 1. Characterization of lactose activity of glutaraldehyde stabilized permeabilized K.fragilis.

Sep 90: 1. Comparative studies of properties of lactase in glutaraldehyde stabilized permeabilized cells, permeabilized cells and isolated enzyme from K.fragilis.

Dec 90: 1. characterisation of alcohol dehydrogenase and aldolase activity of permeabilized baker's yeast whole cells.

Mar 91: 1. Study alcohol dehydrogenase activity in organic solvent sytem and its comparison with that of aqueous system.

Jun 91: 1. Immobilization of glutaraldehyde stabilized whole cell lactase to develop a bio-reactor for continuous hydrolysis of lactose in milk.

Sep 91: 1. Utilization of alcohol dehydrogenase activity of permeabilized baker's yeast cells to produce flavour compounds.

Dec 91: 1. Scaling up of lactose hydrolysis in milk by immobilized whole cell lactase.

Mar 92: 1. Conversion of glucose to ethanol by permeabilized yeast cells.

| Budget Estimate: | (Rs.in Lakhs) 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 1.26 | 1.28 | 2.54 |
| Recurring | 0.40 | 0.40 | 0.80 |
| Capital | 0.55 | 0.24 | 0.79 |
| Total: | 2.21 | 1.92 | 4.13 |

Project No.5 (Food Chemistry): DIETARY INTERVENTION OF METABOLIC DISORDERS: INFLUENCE OF W3 FATTY ACIDS AND SPICE PRINCIPLES IN INFLAMMATORY CONDITION.

Leader: Dr.B.R. Lokesh

Objectives:

1. To utilize food lipids and spice principles for preventing inflammation.

Milestones:-

Mar 91:
1. Establish the methodology for quantitating lipids and lipid mediators.
2. In vitro model system to screen the antioxidant potentials of various spices.

Mar 92:
1. Lipids with antiinflammatory properties of W3 fatty acids will be fed to rats along with potent antioxidants from spices screened in vitro system will be tested for their ability to modulate mediators of inflammation. Essential parameters such as (i) macrophage functions, (ii) prostaglandins and leukotrienes, and (iii) free radicals will be quantitated.

| Budget Estimate: | (Rs.in Lakhs) 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 1.27 | 1.37 | 2.64 |
| Recurring | 0.80 | 0.85 | 1.65 |
| Capital | 3.11 | 0.85 | 3.96 |
| Total: | 5.18 | 3.07 | 8.25 |

Project No.6 (Food Chemistry): ENHANCEMENT OF SHELF-LIFE OF PRAWNS DURING FROZEN STORAGE BY PHYSICAL AND CHEMICAL TREATMENTS.

Leader: Dr.V. Prakash

Objectives:

1. To develop methods for overcoming the problem of drip loss in prawn and enhance its shelf-life during frozen storage and transportation.

Milestones:-

Mar 92: 1. Improvement of shelf-life of prawns during frozen storage.

Budget Estimate:

(Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 0.80 | 0.85 | 1.65 |
| Recurring | 0.10 | 0.10 | 0.20 |
| Capital | 0.35 | - | 0.35 |
| Total: | 1.25 | 0.95 | 2.20 |

Project No.7 (Food Chemistry): CONFORMATIONAL CHANGES INDUCED BY PHYSICAL/CHEMICAL MEANS IN ENZYMES OF RELEVANCE TO FOOD PROCESSING.

Leader: Dr.A.G.Appu Rao

Objectives:

1. To understand structure-function relationship in (a) pectinases, (b) lipoxygenases, conformational transitions induced by structure stabilising solvents and salts.

2. To develop methods for concentrating and fractionating enzyme preparations (fungal pectinases) based on above objective.

Milestones:-

Mar 92: 1. Develop methods to improve enzyme yield by concentration fractionation.

Budget Estimate:

(Rs.in lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 0.90 | 0.95 | 1.85 |
| Recurring | 0.10 | 0.10 | 0.20 |
| Capital | 0.50 | - | 0.50 |
| | 1.50 | 1.05 | 2.55 |

Project No.8 (Microbiology & Sanitation): CHARACTERIZATION, LARGE SCALE PRODUCTION AND APPLICATION OF MICROBIAL POLYSACCHARIDES IN INDIAN FOODS.

Leader: Dr.M.S.Prasad

Objectives:

1. To optimise conditions of incorporation of microbial polysaccharides in Indian foods and to evolve new formulations.

2. Improvements of microbial strains for better yield and quality.

Milestones:-

Jun 90: 1. Use of physical and chemical mutagens and its possible genetic engineering techniques to improve the existing strains for improvement of quality and yield of microbial polysaccharides.

Dec 90: 1. Physical and chemical characterization of polysaccharides.

Jun 91: 1. Pilot plant production of potential useful polysaccharides.

Dec 91: 1. Use of microbial polysaccharides in the preparation and processing of Indian foods and formulating new foods.

Budget Estimate:

| | (Rs. in Lakhs) 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 2.09 | 2.23 | 4.32 |
| Recurring | 0.46 | 0.44 | 0.90 |
| Capital | 0.47 | 0.30 | 0.77 |
| Total: | 3.02 | 2.97 | 5.99 |

Project No.9 (Microbiology & Sanitation): ROLE OF CELL WALLS IN ETHANOL TOLERANCE OF SACCHAROMYCES AND DEVELOPMENT OF AN IMPROVED STRAIN OF S.Cerevisiae FOR HIGH ETHANOL PRODUCTION.

Leader: Dr.S. Umesh Kumar

Objectives:

1. To develop a detailed understanding on the role of cell wall macromolecules in Saccharomyces ethanol tolerance and production.

1. To develop newer strains suitable for high ethanol production.

Milestones:-

Sep 90: 1. Characterization of the identified antigens and topographical studies for localisation.

Sep 91: 1. Mutation experiments, selection, characterization and biochemical studies on important mutants. Fermentation studies on the developed mutant.

Budget Estimate:

| | (Rs.in Lakhs) 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 0.15 | 0.16 | 0.31 |
| Recurring | 0.20 | 0.20 | 0.40 |
| Capital | 0.80 | - | 0.80 |
| Total: | 1.15 | 0.36 | 1.51 |

Project No.10 (Fruits, Vegetables & Plantation Crops): PLANT TISSUE CULTURE FOR PRODUCTION OF SPICE FLAVOURS AND IMPROVEMENT OF PLANTATION CROPS.

Leader: Dr(Mrs) Zakia Bano

Objectives:

1. To generate flavour from spice cultures and improvement of plantation crops.

Milestones:-

Sep 90: 1. Establishment of regenerated plantlets of tea in vermiculite and subsequent transfer to soil.

Mar 91: 1. To establish conditions for regeneration of plantlets in coffee. Formulation of medium to obtain fast growing callus from clove explants.

Sep 91: 1. Shoot tip culture of banana.

Mar 92: 1. Comparative GC/GCMS studies on cllove callus cultures and their corresponding explant sources.

2. Standardization of chemical and histochemical methods to identify the preence of eugenol in clove tissues/cultures.

Budget Estimate: (Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 2.65 | 2.75 | 5.40 |
| Recurring | 1.00 | 1.00 | 2.00 |
| Capital | 0.75 | 0.50 | 1.25 |
| Total: | 4.40 | 4.25 | 8.65 |

Project No.11 (Fruits, Vegetables & Plantation Crops): CULTURING AND UTILIZATION OF THE FRUITING FUNGI AS HUMAN FOOD.

Leader: Dr(Mrs) Zakia Bano

Objectives:

1. Characterization of new fruiting fungi for use as human food.

Milestones:-

Mar 91: 1. Completion of in vitro studies for fruiting fungi.

Sep 91: 1. Substrate selection for in vivo growth.

Mar 92: 1. Culturing of desirable fruiting fungus.

Budget Estimate: (Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 1.20 | 1.22 | 2.42 |
| Recurring | 0.20 | 0.20 | 0.40 |
| Capital | 2.12 | - | 2.12 |
| Total: | 3.52 | 1.42 | 4.94 |

Project No.12 (Animal Products Technology): OPTIMISING CRITICAL FACTORS GOVERNING FOOD OUTPUT AND HANDLING FISH IN HIGH DENSITY SYSTEM.

Leader: Shri N.P. Dani

Objectives:

1. Designing integrated sytem for production and post-harvest handling of fish.

Milestones:-

Sep 90: 1. Building infrastructure facilities.

Dec 90: 1. Development of test feeds.

Mar 91: 1. Influence of physical and biolic factors.

Jun 91: 1. Growth studies.

Sep 91: 1. Utilizaation of detritus.

Dec 91: 1. Conditioning of harvested fish, sensory characters.

Mar 92: 1. Development of packaging, modelling and economic evaluation.

Budget Estimate: (Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 2.00 | 2.50 | 4.50 |
| Recurring | 0.50 | 0.50 | 1.00 |
| Capital | 2.00 | 0.50 | 2.50 |
| Total: | 4.50 | 3.50 | 8.00 |

Project No.13 (Fermentation Technology & Bioengineering): MICROCOMPUTER CONTROL OF FERMENTATION PROCESSES.

Leader: Dr.M.C. Misra

Objectives:

1. To develop a microcomputer sytem for monitoring and control of fermentation processes.

2. To develop simple, flexible softwares for use in laboratories and industries for data logging and control.

3. To develop an optimal control strategy for aerobic, growth associated processes.

Milestones:-

Sep 90: 1. Interfacing equipment, pH meter, DO meter, agitator and solenoid valves, pneumatic valves and alarm switches.

Mar 91: 1. Developing software for data logging, data reduction and noise filtration. Developing software for fermentor control.

Sep 91: 1. Testing the system and developing process oriented softwares.

Mar 92: 1. Developing optimal control strategy for the production of glycerol/yeast.

Budget Estimate: (Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 1.08 | 1.20 | 2.28 |
| Recurring | 0.50 | 0.50 | 1.00 |
| Capital | 4.50 | 2.00 | 6.50 |
| Total: | 6.08 | 3.70 | 9.78 |

Project No.14 (Food Packaging & Distribution Engineering): MODELLING AND COMPUTER SIMULATION OF PACKAGE STRUCTURE AND PERFORMANCE EVALUATION.

Leader: Dr.G.C.P.Ranga Rao

Objectives:

1. To develop mathematical models for various geometric forms of package structures and their relationship to functional performance for computer simulation.

Milestones:-

Sep 90: 1. Geometric modelling of flexible pouches.

Jun 91: 1. Geometric modelling of containers of complex shapes.

Sep 91: 1. Development/adaptation of models for structural analysis of packages.

Jun 92: 1. Development of models for structure - performance relationships for computer simulation.

Budget Estimate: (Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 0.856 | 0.856 | 1.712 |
| Recurring | 0.20 | - | 0.20 |
| Capital | 5.00 | - | 5.00 |
| Total: | 6.056 | 0.856 | 6.912 |

# NATIONAL FACILITIES

Project No.1 (Microbiology & Sanitation): MAINTENANCE OF ECONOMICALLY IMPORTANT MICROORGANISMS RELATED TO FOOD AND FERMENTATION INDUSTRIES.

Leader: Dr.Krishna Nand

Objectives:

1. Collection and maintenance of economically important cultures related to food and fermentation industries (about 50 cultures).

2. Maintenance of these cultures using freeze drying and other methods of storage (sand, soil etc.).

3. Checking for viability, purity and biochemical characteristics.

4. Identification aids.

Milestones:-

Jun 90: 1. Collection of some industrially important cultures from different culture collections and checking their authenticity (morphological and biochemical).

Sep 90: 1. Maintenance of cultures.

2. Documentation (record keeping).

Dec 90: 1. Serving as a repository for industrially important and genetically tailored strains of microorganisms (food, fermentation, dairy industries).

2. Supply of these cultures to the users.

Mar 91: 1. Serving as a repository.

2. Providing identification aid to characterise the selected promising cultures.

Jun 91: 1. Preparing a manual of cultures available in CFTRI - culture collection.

Sep 91: 1. Checking authenticy of collected cultures for biochemical and morphological characteristics.

2. Distribution of cultures.

Dec 91: 1. Repository of cultures.

2. Depository of cultures.

Mar 92: 1. Providing identification aid to characterise selected promising cultures.

2. Strain records (laboratory reference number, date of deposit, cultural requirements, cultural properties) organisation and management of culture collection.

Budget Estimate:

| | (Rs.in Lakhs) 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 1.58 | 1.74 | 3.32 |
| Recurring | 1.00 | 1.00 | 2.00 |
| Capital | 16.01 | - | 16.01 |
| Total: | 18.59 | 2.74 | 21.33 |

Project No.2 (Food Packaging & Distribution Engineering): SIMULATION OF DISTRIBUTION HAZARDS AND PREDICTION OF PACKAGE PERFORMANCE BY LABORATORY TESTS.

Leader: Shri H.S.Satish

Objectives:

1. To collect the data on transport handling and storage hazards.

2. To build the test facilities to simulate the hazards in the lab and to develop realistic test schedules.

Milestones:-

Dec 90: 1. Testing the suitability of instruments for the measurement of distribution hazards and modification to suit the local levels of hazards.

2. Design of packages and mountings for the instruments to be carried in the transport system and their retrieval after the experiments.

Mar 91: 1. Collection of the transportation and storage data - drop height, vibration, temperature and RH atleast in three major road and rail transportation routes for food packages.

Jun 91: 1. Statistical analysis and interpretation of the data.

Sep 91: 1. Procurement and installation of the vibration simulation equipment.

Mar 92: 1. Development of test schedules for transport hazard simulation as per the acquired data.

Budget Estimate: (Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 1.4 | 1.5 | 2.9 |
| Recurring | 0.90 | 0.65 | 1.55 |
| Capital | 24.5 | 1.0 | 25.5 |
| Total: | 26.80 | 3.15 | 29.95 |

Project No.3 (Food Packaging & Distribution Engineering): PREPARATION OF READY REFERENCE MANUALS ON FOOD PACKAGING FROM LABORATORY R&D FINDINGS.

Leader: Shri A.R.Vijayendra Rao

Objectives:

1. To bring out user reference manuals on packaging of food commodities.

2. To compile technical data books on packaging materials and practices.

Milestones:-

Sep 90: 1. Collection of inhouse of outside literature.

Dec 90: 1. Compilation in the form of reference manual.

Mar 91: 1. Continuation of the same and prepublication refeering.

Jun 91: 1. On selection and design considerations for transport containers and flexible packaging materials (unit packs): i) collection of literature and technical data from inhouse and outside sources.

Sep 91: 1. Compilation of the reference manuals.

Dec 91: 1. Continuation of the same and prepublication refeering.

Mar 92: 1. Final related publication activities.

Budget Estimate:

(Rs.in Lakhs)

| | 1990-91 | 1991-92 | Total |
|---|---|---|---|
| Personnel | 0.72 | 0.75 | 1.47 |
| Recurring | 12.00 | 19.00 | 31.00 |
| Capital | - | - | - |
| Total: | 12.72 | 19.75 | 32.47 |

Financial Picture for 1989-90
and

Research projects funded by organisations
other than CSIR

(For kind information of Reserch Council)

Financial Picture for 1989-90
and

SANCTIONED BUDGET FOR 1989-90 AND THE EXPENDITURE INCURRED DURING THE PRECEEDING 2 YEARS.

TABLE-I FINANCIAL OUTLAY ON INFRASTRUCTURE AND R&D SCINCE BUDGET

(RS. IN LAKHS)

| BUDGET HEAD | ACTUAL EXPENDITURE | | SANCTIONED BUDGET |
|---|---|---|---|
| | 1987-88 | 1988-89 | 1989-90 |
| PART A | | | |
| INFRASTRUCTURE/MAINTENANCE BUDGET P1,P2,P3,P4,P6 | 369.80 | 380.40 | 426.00 |
| PART B | | | |
| R&D SCIENCE BUDGET P5(1),P5(2),P5(3) P5(4)i,ii,iii & P7 | 93.10 | 96.70 | 134.00 |
| TOTAL | 462.90 | 477.10 | 560.00 |

TABLE-II OUTLAY WITH BREAK-UP FOR DIFFERENT HEADS OF EXPENDITURE

| BUDGET HEAD | ACTUAL EXPENDITURE | | SANCTIONED BUDGET |
|---|---|---|---|
| | 1987-88 | 1988-89 | 1989-90 |
| **PART-A INFRASTRUCTURE/MAINTENANCE BUDGET** | | | |
| 1.SALARIES | 327.50 | 335.20 | 372.00 |
| 2.CONTINGENCIES | 39.30 | 41.90 | 50.00 |
| 3.MAINTENANCE | 3.00 | 3.30 | 4.00 |
| TOTAL A | 369.80 | 380.40 | 426.00 |
| **PART-B R&D SCIENCE BUDGET** | | | |
| 4.WORKS & SERVICES | 8.20 | 2.50 | 2.00 |
| 5.EQUIPMENT | 38.10 | 44.00 | 57.00 |
| 6.CONSUMABLES | 35.00 | 35.40 | 54.00 |
| 7.BOOKS,FURNITURE & VEHICLES | 11.80 | 14.80 | 21.00 |
| TOTAL B | 93.10 | 96.70 | 134.00 |
| GRAND TOTAL A+B | 462.90 | 477.10 | 560.00 |

## EXTERNAL CASH FLOW

(RS. IN LAKHS)

| NATURE OF CASH FLOW | 1988-89 | (APRIL 89 TO NOV.89) |
|---|---|---|
| 1.INTELLECTUAL PROPERTY | | |
| PREMIA | 5.460 | 2.780 |
| 2.CONTRACT RESEARCH | | |
| A.SPONSORED | 26.300 | 17.790 |
| B.GRANT-IN-AID | 10.330 | 7.890 |
| 3.CONSULTANCY | 12.670 | 4.740 |
| 4.TECHNICAL SERVICES | | |
| A.ANALYTICAL/TESTING | 8.170 | 4.380 |
| B.SALE PRODUCTS/ PUBLICATIONS | 8.920 | 1.430 |
| C.TRAINING | 6.850 | 8.020 |
| D.OTHER SERVICES | 39.550 | 17.430 |
| TOTAL | RS.118.250 | 64.460 |

## Research projects funded by organisations other than CSIR

Project No.1 (Autotrophic Cell Culture): BIOTECHNOLOGY OF SPIRULINA FOR USE IN FEEDS AND FOODS.

Principal Investigator : Dr.L.V.Venkataraman

Period : Sep. 1988 to Aug. 1991

Objectives:-

a) To generate additional information and data for the commercial production of Spirulina with suitable harvesting and drying procedures to obtain food grade algae.

b) To develop suitable economical and commercial prdocuts and evaluation of the quality.

c) To carryout cost benefit analysis of the products developed.

Funding authority : M/s Ballarpur Industries Limited, New Delhi

Finance granted : Rs.10,56,500

Project No.2 (Fermentation Technology & Bioengineering): ENGINEERING STUDIES ON TRANSPORT PHENOMENA IN SOLID STATE FERMENTATION FOR PROCESS OPTIMIZATION AND PLANT DESIGN.

Principal Investigator : Dr.N.G.Karanth

Period : Apr. 1989 to Mar. 1994

Objectives:-

(a) To generate data on proprties of materials figuring in SSF : Thermal conductivity, mass and thermal diffusivity of moist solid substrate, microbial growth, particle size, sterilisation conditions.

(b) Development of an appropriate mathematical model for the interactive effects of bioreaction kinetics and inter and intraparticles heat and mass transport, to evolve effective rate equations for the design of SSF reactors.

(c) Theoretical and experimental comparison of different types of SSF equipment such as static trays, packed bed reactor and rotating drums; different methods of mixing and heat removal.

(d) Development of appropriate methods for monitoring and control of SSF systems.

(e) Evolution of appropriate design and scale up criteria based on the mathematical models developed for specific systems.

Funding authority : Department of Biotechnology, Govt. of India

Finance granted : Rs.42.35 lakhs

Project No.3 (Microbiology & Sanitation): PILOT-SCALE STUDIES ON METHANE GENERATION FROM FRUIT AND VEGETABLE PROCESSING WASTES.

Principal Investigator : Dr.Krishna Nand

Period : Feb. 1989 to Jul. 1990

Objectives:-

(a) Setting up of a pilot-scale plant of two units of 25 $m^3$ capacity each based on fruit and vegetable processing wastes.

(b) Studies on stabilisation and optimisation of such plants.

(c) Scaling up and process economics.

(d) Studies on starving the digesters and further initiating anaerobic digestion.

(e) Slurry disposal and utilisation.

(f) Techno-economic analysis of the system.

Funding authority : Dept. of Non-conventional Energy Sources (DNES), Govt of India

Finance granted : Rs.4.5 lakhs

Project No.4 (Oilseeds Technology): DIRECT OIL EXTRACTION FROM COCONUTS AND DEVELOPMENT OF CONVENIENCE ORIENTED COCONUT BASED PRODUCTS.

Principal Investigator : Dr.G.Ramanatham

Period : Apr. 1988 to Mar. 1990

Objectives:-

(a) Modification of Krauss-Mafi process to produce acceptable coconut oil and a product similar to desiccated coconut.

(b) Exploring the technical feasibility of preparing a coconut based beverage.

(c) Lab scale development of various feasible products containing partially defatted coconut solids, their screening w.r.t. acceptability and large scale preparations of those formulae found acceptable for market study.

Funding authority : M/s Coconut Development Board

Finance granted : Rs.3 lakhs

Project No.5 (Oilseeds Technology): STUDIES ON PROTEIN HYDROLYSATES.

Principal Investigator : Dr.G.Ramanatham

Period : Aug. 1989 to Jan. 1990

Objectives:-

(a) Standardisation of process for protein hydrolysate as base material for edible groundnut cake flour and papain as the enzyme.

(b) To obtain finished product in the form of a liquid/semi-solid concentrate from the results of partial hydrolysis of protein.

(c) To produce a vacuum shelf dried or spray dried product with adjuncts and additives to achieve better preservation of the hydrolysate.

Funding authority : M/s Modern Proteins Limited, Kurnool

Finance granted : Rs.76,000

Project No.6 (Fruits, Vegetables & Plantation Crops): STUDIES ON STANDARDISATION OF AN OBJECTIVE ANALYTICAL TECHNIQUE FOR IDENTIFICATION OF ADDED FLAVOUR IN TEA.

Principal Investigators : Dr.M.L.Shankaranarayana
Dr.M.N.Krishna Murthy

Period : Jul. 1989 to Jul. 1990

Objectives:-

(a) To standardise an objective analytical technique for identification of added flavour in tea.

(b) Evaluation of the added flavour and its estimation and detection in stored samples of flavoured tea.

Funding authority : M/s Brooke Bond India Limited, Bangalore

Finance granted : Rs.1,17,500

Project No.7 (Food Chemistry): STRUCTURE-FUNCTION RELATIONSHIP OF A LECTIN FROM DOLICHOS LABLAB AND A UNIQUE TRYPTIC/CHYMOTRYPTIC INHIBITOR FROM DOLICHOS LABLAB.

Principal Investigator : Dr.D.Rajagopal Rao

Period : Jun. 1989 to Jun. 1992

Objectives:-

(a) To co-relate at the molecular level, the structure-function relationship of the lectin and protease inhibitor - active sites and domains involved in lectin-carbohydrate and enzyme-inhibitor interaction.

Funding authority : Department of Science & Technology

Finance granted : Rs.14,54,875

Project No.8 (Nutrition & Food Safety): IN VITRO ENZYMATIC METHOD TO ASSESS TOXICITY OF CHEMICALS - A PREDICTIVE TOXICCOLOGY APPROVAL.

Principal Investigator : Dr.K.S.Jagannath Rao

Period : Jan. 1990 to Jan. 1992

Objectives:-

(a) Predicting toxicity of chemicals using enzymes as model systems.

Funding authority : Department of Science & Technology

Finance granted : Rs.1,58,000

Project No.9 (Cereal Science & Technology): REGIONAL EXTENSION SERVICE CENTRE (RICE MILLING).

Principal Investigator : Dr.S.Z.Ali

Period : Apr. 1984 to Feb. 1990

Objectives:-

(a) Modernisation of rice milling industries for good yield and better utilisation of value-added byproducts.

Funding authority : Ministry of Food Procesing Industries, Govt. of India

Finance granted : Rs.16.80 lakhs

Project No.10 (Oilseeds Technology):

(A) IMPROVING THE EFFICIENCY OF GHANIS FOR BETTER OIL RECOVERY AND VALUE-ADDED PRODUCTS.

(B) IMPROVEMENT IN GHANI DESIGN AND OPTIMISATION OF UNIT OPERATIONS FOR OILSEEDS.

Principal investigators: Dr.G.Ramanatham
Dr.M.C.Shamanthaka Sastry

Objectives:-

(A) Modernisation of processing of oilseeds by Ghani to recover oil through appropriate technology, with emphasis on precleaning, grading, and dehulling followed by Ghani pressing for better oil extraction and to obtain value-added products. (Oilseeds: mustard, seasame, safflower, niger).

(B) To improve upon the existing Ghani to obtain increased recovery as welll as better quality oil by direct crushing of oilseeds.

Funding authority : KVIC, Bombay.

Finance granted : For project (A): Rs.5 lakhs

For project (B): Rs.4.5 lakhs